

COPC: Barium CAS 7440-39-3

Test Organisms: Dog (Omnivore, Order-Carnivora)

Exposure Medium: Oral

Test Endpoint: FEL LD-100

Reference: Venugopal, B., and T.D. Luckey, 1978, The Toxicity of Metals in Mammals, Plenum Press, New York.

QCE: 59 mg/kg-day

| Adjustment Factors (AF) | | | | Justification for adjustment factor |
|-------------------------|------|------|------|---|
| R | 1 | 2 | 3 | R = 1 is AF for same order and trophic level R = 2 is AF for different order and same trophic level R = 3 is AF for different order and trophic level |
| I | 3 | 3 | 3 | No information (secondary source) |
| Q ₁ | 1 | 1 | 1 | Endpoint expected to be ecologically significant (mortality). |
| Q ₂ | 3 | 3 | 3 | Acute study |
| Q ₃ | 3 | 3 | 3 | Lethal endpoint |
| U | 3 | 3 | 3 | Acute study; no other information (secondary source) |
| Total AF | 81 | 162 | 243 | $R * I * Q_1 * Q_2 * Q_3 * U = \text{Total AF}$ |
| QCE (mg/kg-day) | 59 | 59 | 59 | QCE = quantified critical endpoint |
| TRV | 0.73 | 0.36 | 0.24 | Toxicity Reference Value = QCE/Total AF |

| R Value | TRV (mg/kg-day) | Justification | Appropriate Functional Group |
|---------|-----------------|--|--|
| 1 | 0.73 | Test organism is in the same order and trophic level as the functional group members | M422A |
| 2 | 0.36 | Test organism is in a different order and same trophic level from the functional group members | M422 |
| 3 | 0.24 | Test organism is in a different order and trophic level from the functional group members | M121, M122, M122A, M123, M210, M210A, M222, M322 |

COPC: Barium CAS 7440-39-3

Test Organisms: Rat (Omnivore, Order-Rodentia)

Exposure Medium: Water

Test Endpoint: NEL

Reference: Perry, H.M. et al. 1989, "Hypertension and associated cardiovascular abnormalities induced by chronic barium feeding," Journal of Toxicology and Environmental Health, 28(3):373-388.
Kopp, S.J. et al. 1985, "Cardiovascular dysfunction and hypersensitivity to sodium pentobarbital induced by chronic barium chloride ingestion, Toxicology and Applied Pharmacology, 77(23):303-314.

QCE: 35.6 mg/kg-day (100 mg/L)*(0.015L/day)/0.45kg BW

| Adjustment Factors (AF) | | | | Justification for adjustment factor |
|-------------------------|------|------|------|---|
| R | 1 | 2 | 3 | R = 1 is AF for same order and trophic level R = 2 is AF for different order and same trophic level R = 3 is AF for different order and trophic level |
| I | 1 | 1 | 1 | Chronic toxicity studies with adequate numbers of animals |
| Q ₁ | 0.5 | 0.5 | 0.5 | Although endpoint examined (increased blood pressure at higher doses) could occur in ecological receptors, the absence of any effects on growth and longevity at any dose argues against its ecological relevance. But at the NOAEL dose, no hypersensitivity was observed. |
| Q ₂ | 1 | 1 | 1 | Chronic study (16 months) |
| Q ₃ | 1 | 1 | 1 | NEL |
| U | 1 | 1 | 1 | Concordant results in several detailed studies |
| M | 0.5 | 0.5 | 0.5 | Soluble salt in the drinking water was used |
| Total AF | 0.25 | 0.50 | .075 | $R * I * Q_1 * Q_2 * Q_3 * U * M = \text{Total AF}$ |
| QCE (mg/kg-day) | 35.6 | 35.6 | 35.6 | QCE = quantified critical endpoint |
| TRV | 142 | 71.2 | 47.5 | Toxicity Reference Value = QCE/Total AF |

| R Value | TRV (mg/kg-day) | Justification | Appropriate Functional Group |
|---------|-----------------|--|--|
| 1 | 142 | Test organism is in the same order and trophic level as the functional group members | none |
| 2 | 71.2 | Test organism is in a different order and same trophic level from the functional group members | M422, M422A |
| 3 | 47.5 | Test organism is in a different order and trophic level from the functional group members | M121, M122, M122A, M132, M210, M210A, M222, M322 |

*BW given by an earlier Perry article, ingestion rate specified in the article

**note-10ppm had some adverse effects such as an increase in blood pressure and tissue concentration.

COPC: Barium Chloride CAS 10361-37-2

Test Organisms: Rat

Exposure Medium: Oral gavage

Test Endpoint: NOAEL

Reference: Borzelleca, J.F., Condie Jr., L.W. and J.L. Egle Jr., 1988, "Short-Term Toxicity (One- and Ten-Day Gavage) of Barium Chloride in Male and Female Rats", *Journal of the American College of Toxicity* 7(5): 675-685.

QCE: 209 mg/kg-day

| Adjustment Factors (AF) | | | | Justification for adjustment factor |
|-------------------------|------|------|------|--|
| R | 1 | 2 | 3 | R = 1 is AF for same order and trophic level R = 2 is AF for different order and same trophic level R = 3 is AF for different order and trophic level |
| I | 2 | 2 | 2 | Groups of males and females (10 of each sex) were formed. 1 day study received deionized water (20 ml/kg body weight) and doses of 30, 100, and 300 mg/kg. 10 day study received the same water and doses of 100, 145, 209, and 300 mg/kg. |
| Q ₁ | 1 | 1 | 1 | Body weight and selected organs (brain, spleen, lungs, thymus, kidneys, and testes or ovaries) were measured. |
| Q ₂ | 3 | 3 | 3 | Short-term study (1 or 10 days) |
| Q ₃ | 1 | 1 | 1 | NOAEL |
| U | 2 | 2 | 2 | Good use of other supporting sources, no reproductive endpoints or sensitive life stages studied. |
| Total AF | 12 | 24 | 36 | $R * I * Q_1 * Q_2 * Q_3 * U = \text{Total AF}$ |
| QCE (mg/kg-day) | 209 | 209 | 209 | QCE = quantified critical endpoint |
| TRV | 17.4 | 8.71 | 5.81 | Toxicity Reference Value = QCE/Total AF |

| R Value | TRV (mg/kg-day) | Justification | Appropriate Functional Group |
|---------|-----------------|--|--|
| 1 | 17.4 | Test organism is in the same order and trophic level as the functional group members | none |
| 2 | 8.71 | Test organism is in a different order and same trophic level from the functional group members | M422, M422A |
| 3 | 5.81 | Test organism is in a different order and trophic level from the functional group members | M121, M122, M122A, M132, M210, M210A, M222, M322 |

COPC: Benzo(a)anthracene (BaA) CAS 56-55-3

Test Organisms: Mouse (Omnivore, Order-Rodentia)

Exposure Medium: Oral (gavage solution)

Test Endpoint: FEL

Reference: Klein, M., 1963. "Susceptibility of strain B6AF/j hybrid infant mice to tumorigenesis with 1,2-benzoanthracene, deoxycholic acid, and 3-methylcholanthrene," *Cancer Research*, 23:1701-1707.

QCE: 50 mg/kg-day (22.5 mg/mouse-total)*(1 mouse/0.03125 kg BW)*(total dose/15 days)

| Adjustment Factors (AF) | | | | Justification for adjustment factor |
|-------------------------|-----|-----|-----|---|
| R | 1 | 2 | 3 | R = 1 is AF for same order and trophic level R = 2 is AF for different order and same trophic level R = 3 is AF for different order and trophic level |
| I | 2 | 2 | 2 | Infant males tested. No females tested. |
| Q ₁ | 0.1 | 0.1 | 0.1 | Cancer endpoint |
| Q ₂ | 1 | 1 | 1 | Long-term (547-day) study |
| Q ₃ | 3 | 3 | 3 | FEL |
| U | 3 | 3 | 3 | Statistical evaluation of data not reported. |
| Total AF | 1.8 | 3.6 | 5.4 | $R * I * Q_1 * Q_2 * Q_3 * U = \text{Total AF}$ |
| QCE (mg/kg-day) | 50 | 50 | 50 | QCE = quantified critical endpoint |
| TRV | 28 | 14 | 9.3 | Toxicity Reference Value = QCE/Total AF |

| R Value | TRV (mg/kg-day) | Justification | Appropriate Functional Group |
|---------|-----------------|--|--|
| 1 | 28 | Test organism is in the same order and trophic level as the functional group members | none |
| 2 | 14 | Test organism is in a different order and same trophic level from the functional group members | M422, M422A |
| 3 | 9.3 | Test organism is in a different order and trophic level from the functional group members | M121, M122, M122A, M132, M210, M210A, M222, M322 |

*22.5 specified in article

**BW given in Dames and Moore Animal Data Table

***Dose was given 3 days/week for 5 weeks = 15 days

COPC: Benzo(a)pyrene CAS 50-32-8

Test Organisms: Mouse (Omnivore, Order-Rodentia)

Exposure Medium: Oral (gavage)

Test Endpoint: FEL

Reference: Klein, M., 1963. "Susceptibility of Strain B6AF/j Hybrid Infant Mice to Tumorigenesis with 1,2-Benxanthracene, deoxycyclic acid, and 3-methylcholanthrene", *Cancer Research*, 23:1701-1707.

QCE: 500 mg/kg-day

| Adjustment Factors (AF) | | | | Justification for adjustment factor |
|-------------------------|-----|-----|------|---|
| R | 1 | 2 | 3 | R = 1 is AF for same order and trophic level R = 2 is AF for different order and same trophic level R = 3 is AF for different order and trophic level |
| I | 2 | 2 | 2 | Infant males tested. |
| Q ₁ | 0.1 | 0.1 | 0.1 | Cancer endpoint |
| Q ₂ | 1 | 1 | 1 | Chronic (547-day) study |
| Q ₃ | 3 | 3 | 3 | FEL |
| U | 3 | 3 | 3 | Statistical evaluation of data not reported. Number of animals tested not reported. |
| Total AF | 1.8 | 3.6 | 5.4 | $R * I * Q_1 * Q_2 * Q_3 * U = \text{Total AF}$ |
| QCE (mg/kg-day) | 500 | 500 | 500 | QCE = quantified critical endpoint |
| TRV | 278 | 139 | 92.6 | Toxicity Reference Value = QCE/Total AF |

| R Value | TRV (mg/kg-day) | Justification | Appropriate Functional Group |
|---------|-----------------|--|--|
| 1 | 278 | Test organism is in the same order and trophic level as the functional group members | none |
| 2 | 139 | Test organism is in a different order and same trophic level from the functional group members | M422, M422A |
| 3 | 92.6 | Test organism is in a different order and trophic level from the functional group members | M121, M122, M122A, M132, M210, M210A, M222, M322 |

COPC: Cadmium CAS 7440-43-9

Test Organisms: Chicken (Omnivore, Order-Galliformes)

Exposure Medium: Diet

Test Endpoint: LOAEL Body weight gain, mortality

Reference: Pritzel, M.C., Y.H. Lie, E.W. Kienholz, and C.E. Whiteman, 1974, *The Effect of Dietary Cadmium on the Development of Young Chickens*, Poultry Sci. 53:2026-2029.

QCE: 29 mg/kg-day (400mg/kg)*(0.11kg/day)/0.151 kg bw

| Adjustment Factors (AF) | | | | Justification for adjustment factor |
|-------------------------|------|------|------|---|
| R | 1 | 2 | 3 | R = 1 is AF for same order and trophic level R = 2 is AF for different order and same trophic level R = 3 is AF for different order and trophic level |
| I | 2 | 2 | 2 | Adequate numbers of males tested, 100 |
| Q ₁ | 1 | 1 | 1 | Endpoint ecologically relevant (growth, mortality). |
| Q ₂ | 2 | 2 | 2 | Subchronic study |
| Q ₃ | 3 | 3 | 3 | LOAEL endpoint, but mortality observed |
| U | 3 | 3 | 3 | No reproductive endpoints examined, however, sensitive life stage examined. High doses tested. Presence of zinc in diet may have influenced (decreased) cadmium toxicity. NOAEL not identified. |
| Total AF | 36 | 72 | 108 | $R * I * Q_1 * Q_2 * Q_3 * U = \text{Total AF}$ |
| QCE (mg/kg-day) | 29 | 29 | 29 | QCE = quantified critical endpoint |
| TRV | 0.81 | 0.40 | 0.27 | Toxicity Reference Value = QCE/Total AF |

| R Value | TRV (mg/kg-day) | Justification | Appropriate Functional Group |
|---------|-----------------|--|--|
| 1 | 0.81 | Test organism is in the same order and trophic level as the functional group members | none |
| 2 | 0.40 | Test organism is in a different order and same trophic level from the functional group members | AV422, AV432, AV433, AV442 |
| 3 | 0.27 | Test organism is in a different order and trophic level from the functional group members | AV121, AV122, AV132, AV142, AV143, AV210, AV210A, AV221, AV222, AV222A, AV232, AV233, AV241, AV242, AV310, AV322, AV333, AV342 |

*Ingestion rate specified

**BW estimated through the Rosomer article, 1961.

COPC:**Cadmium CAS 7440-43-9****Test Organisms:**

Black Duck (Herbivore, Order-Anseriformes)

Exposure Medium:

Diet

Test Endpoint:

LOAEL

Reference:Heinz, G.H. and Haseltine, S.D., 1983, "Altered Avoidance Behavior of Young Black Ducks Fed Cadmium". *Environ. Toxicol. Chem.* 2:419-421. As cited in Eisler, 1985.**QCE:**

0.14 mg/kg-day (4 mg/kg)*(0.06 kg/day)/1.7 kg BW

| Adjustment Factors (AF) | | | | Justification for adjustment factor |
|-------------------------|------|------|------|---|
| R | 1 | 2 | 3 | R = 1 is AF for same order and trophic level R = 2 is AF for different order and same trophic level R = 3 is AF for different order and trophic level |
| I | 1 | 1 | 1 | Adequate numbers tested, males, females and juveniles given the doses. |
| Q ₁ | 1 | 1 | 1 | Ecologically relevant endpoint (behavior). |
| Q ₂ | 1 | 1 | 1 | Chronic (90-day) exposure |
| Q ₃ | 2 | 2 | 2 | LOAEL endpoint |
| U | 2 | 2 | 2 | Reproductive endpoints and sensitive life stage examined, but only data given was on the flight response of the juveniles. |
| M | 0.5 | 0.5 | 0.5 | Cadmium chloride in the feed |
| Total AF | 2 | 4 | 6 | $R * I * Q_1 * Q_2 * Q_3 * U = \text{Total AF}$ |
| QCE (mg/kg-day) | 0.14 | 0.14 | 0.14 | QCE = quantified critical endpoint |
| TRV | 0.07 | 0.04 | 0.2 | Toxicity Reference Value = QCE/Total AF |

| R Value | TRV (mg/kg-day) | Justification | Appropriate Functional Group |
|---------|-----------------|--|--|
| 1 | 0.07 | Test organism is in the same order and trophic level as the functional group members | AV142, AV143 |
| 2 | 0.04 | Test organism is in a different order and same trophic level from the functional group members | AV121, AV122, AV132 |
| 3 | 0.02 | Test organism is in a different order and trophic level from the functional group members | AV210, AV210A, AV221, AV222, AV222A, AV232, AV233, AV242, AV310, AV322, AV333, AV342, AV422, AV432, AV433, AV442 |

COPC: Cadmium CAS 7440-43-9

Test Organisms: Rat (Omnivore, Order-Rodentia)

Exposure Medium: Diet

Test Endpoint: LOAEL

Reference: Wills, J.H., Groblewski, G.E., Coulston, F., 1981, *Chronic and Multigeneration Toxicities of Small Concentrations of Cadmium in the Diet of Rats*, Ecotoxicol. Environ. Safety. 5:452-464.
ATSDR, Agency for Toxic Substance Disease Registry, 1989, *Toxicological Profile for Cadmium*, March, 1989.

QCE: 5.5 E-3 mg/kg-day Specified

| Adjustment Factors (AF) | | | | Justification for adjustment factor |
|-------------------------|--------|--------|--------|---|
| R | 1 | 2 | 3 | R = 1 is AF for same order and trophic level R = 2 is AF for different order and same trophic level R = 3 is AF for different order and trophic level |
| I | 1 | 1 | 1 | Adequate numbers of males females and juveniles tested. |
| Q ₁ | 1 | 1 | 1 | Ecologically relevant endpoint (growth, mortality). |
| Q ₂ | 1 | 1 | 1 | Chronic study |
| Q ₃ | 2 | 2 | 2 | LOAEL |
| U | 1 | 1 | 1 | Excellent design, four-generational study. |
| Total AF | 2 | 4 | 6 | $R * I * Q_1 * Q_2 * Q_3 * U = \text{Total AF}$ |
| QCE (mg/kg-day) | 5.5E-3 | 5.5E-3 | 5.5E-3 | QCE = quantified critical endpoint |
| TRV | 3E-3 | 1E-3 | 8E-4 | Toxicity Reference Value = QCE/Total AF |

| R Value | TRV (mg/kg-day) | Justification | Appropriate Functional Group |
|---------|-----------------|--|--|
| 1 | 3E-3 | Test organism is in the same order and trophic level as the functional group members | none |
| 2 | 1E-3 | Test organism is in a different order and same trophic level from the functional group members | M422, M422A |
| 3 | 8E-4 | Test organism is in a different order and trophic level from the functional group members | M121, M122, M122A, M132, M210, M210A, M222, M322 |

COPC:**Chromium(III)** CAS 7440-47-3**Test Organisms:**

Rat (Omnivore, Order-Rodentia)

Exposure Medium:

Diet

Test Endpoint:

NOAEL

Reference:Ivankovic and Preussmann, 1975, *Absence of Toxic and Carcinogenic Effects After Administration of High Doses of Chromic Oxide Pigment in Subacute and Long-Term Feeding Experiments in Rats*, Food Cosmet. Toxicol., 13(3): 347-351.**QCE:**

1500 mg/kg-day 1800 g/kg total dose consumed at highest dose rate, administered 5 days/week for 120 weeks (~840 days total), corrected for % Cr.

| Adjustment Factors (AF) | | | | Justification for adjustment factor |
|-------------------------|------|------|------|---|
| R | 1 | 2 | 3 | R = 1 is AF for same order and trophic level R = 2 is AF for different order and same trophic level R = 3 is AF for different order and trophic level |
| I | 1 | 1 | 1 | Chronic toxicity study with adequate numbers of animals |
| Q ₁ | 1 | 1 | 1 | No endpoint affected (treatments had no effect on life expectancy, food consumption, growth rate, or cancer incidence). |
| Q ₂ | 1 | 1 | 1 | Chronic study |
| Q ₃ | 1 | 1 | 1 | NOAEL endpoint |
| U | 2 | 2 | 2 | Large chronic study |
| Total AF | 2 | 4 | 6 | $R * I * Q_1 * Q_2 * Q_3 * U = \text{Total AF}$ |
| QCE (mg/kg-day) | 1500 | 1500 | 1500 | QCE = quantified critical endpoint |
| TRV | 750 | 375 | 250 | Toxicity Reference Value = QCE/Total AF |

| R Value | TRV (mg/kg-day) | Justification | Appropriate Functional Group |
|---------|-----------------|--|--|
| 1 | 750 | Test organism is in the same order and trophic level as the functional group members | none |
| 2 | 375 | Test organism is in a different order and same trophic level from the functional group members | M422, M422A |
| 3 | 250 | Test organism is in a different order and trophic level from the functional group members | M121, M122, M122A, M132, M210, M210A, M222, M322 |

COPC:**Chromium (III)** CAS 7440-47-3**Test Organisms:**

Chicken (Omnivore, Order-Galliformes)

Exposure Medium:

Diet

Test Endpoint:

NOAEL

Reference:Romoser, G.L., W.A. Dudley, L.J. Machlin, and L. Loveless, 1961, *Toxicity of Vanadium and Chromium for the Growing Chick*, Poultry Science, 40:1171-1173.**QCE:**

49 mg/kg-day

| Adjustment Factors (AF) | | | | Justification for adjustment factor |
|-------------------------|-----|-----|-----|---|
| R | 1 | 2 | 3 | R = 1 is AF for same order and trophic level R = 2 is AF for different order and same trophic level R = 3 is AF for different order and trophic level |
| I | 2 | 2 | 2 | Primary source available |
| Q ₁ | 1 | 1 | 1 | Ecologically relevant endpoint (growth, mortality). |
| Q ₂ | 2 | 2 | 2 | Subchronic exposure duration |
| Q ₃ | 1 | 1 | 1 | NOAEL endpoint |
| U | 3 | 3 | 3 | Old study, limited endpoints |
| Total AF | 12 | 24 | 36 | $R * I * Q_1 * Q_2 * Q_3 * U = \text{Total AF}$ |
| QCE (mg/kg-day) | 49 | 49 | 49 | QCE = quantified critical endpoint |
| TRV | 4.1 | 2.0 | 1.4 | Toxicity Reference Value = QCE/Total AF |

| R Value | TRV (mg/kg-day) | Justification | Appropriate Functional Group |
|---------|-----------------|--|--|
| 1 | 4.1 | Test organism is in the same order and trophic level as the functional group members | none |
| 2 | 2.0 | Test organism is in a different order and same trophic level from the functional group members | AV422, AV432, AV433, AV442 |
| 3 | 1.4 | Test organism is in a different order and trophic level from the functional group members | AV121, AV122, AV132, AV142, AV143, AV210, AV210A, AV221, AV222, AV222A, AV232, AV233, AV241, AV242, AV310, AV322, AV333, AV342 |

COPC:**Chrysene** CAS 218-01-9**Test Organisms:**

Mouse (Omnivore, Order-Rodentia)

Exposure Medium:

Dermal

Test Endpoint:

LOAEL

Reference:

Hecht, S.S., Bondinell, W.E., Hoffmann, D., 1974. "Chrysene and methylchrysenes: Presence in tobacco smoke and carcinogenicity" *J. Nat. Cancer Inst.*, 53:1121-1133.

US Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, 1990, *Toxicological Profile for Chrysene*, March.

QCE:

1.2 mg/kg-day

| Adjustment Factors (AF) | | | | Justification for adjustment factor |
|-------------------------|------|------|------|---|
| R | 1 | 2 | 3 | R = 1 is AF for same order and trophic level R = 2 is AF for different order and same trophic level R = 3 is AF for different order and trophic level |
| I | 2 | 2 | 2 | 20 female Swiss mice (Ha/ICR/Mil). |
| Q ₁ | 1 | 1 | 1 | Endpoint of relevant ecological significance |
| Q ₂ | 1 | 1 | 1 | Chronic (Applied 3 times weekly for 17 months) |
| Q ₃ | 2 | 2 | 2 | LOAEL endpoint - benign and malignant skin tumors |
| U | 3 | 3 | 3 | Limited information supplied in ATSDR reference. No results of the control group or supporting data, dose estimated from topical application. |
| Total AF | 12 | 24 | 36 | $R * I * Q_1 * Q_2 * Q_3 * U = \text{Total AF}$ |
| QCE (mg/kg-day) | 1.2 | 1.2 | 1.2 | QCE = quantified critical endpoint |
| TRV | 0.10 | 0.05 | 0.03 | Toxicity Reference Value = QCE/Total AF |

| R Value | TRV (mg/kg-day) | Justification | Appropriate Functional Group |
|---------|-----------------|--|--|
| 1 | 0.10 | Test organism is in the same order and trophic level as the functional group members | none |
| 2 | 0.05 | Test organism is in a different order and same trophic level from the functional group members | M422, M422A |
| 3 | 0.03 | Test organism is in a different order and trophic level from the functional group members | M121, M122, M122A, M132, M210, M210A, M222, M322 |

COPC: Cobalt (cobalt chloride) CAS 7440-48-4

Test Organisms: Chicken (Omnivore, Order-Galliformes)

Exposure Medium: Diet

Test Endpoint: LOAEL Increased mortality associated with *S. gallinarium* infection

Reference: Hill, C.H., 1979, "The effect of dietary protein levels on mineral toxicity in chicks," Journal of Nutrition, 109:501-507.

QCE: 10.2 mg/kg-day 100 ppm in diet converted to dose using an ingestion rate* of 0.02 kg/day and estimated body weight of 0.2kg from study.

| Adjustment Factors (AF) | | | | Justification for adjustment factor |
|-------------------------|-------|-------|-------|---|
| R | 1 | 2 | 3 | R = 1 is AF for same order and trophic level R = 2 is AF for different order and same trophic level R = 3 is AF for different order and trophic level |
| I | 2 | 2 | 2 | Adequate numbers of animals, but variability not addressed. |
| Q ₁ | 1 | 1 | 1 | Endpoint ecologically relevant |
| Q ₂ | 2 | 2 | 2 | Subchronic duration |
| Q ₃ | 2 | 2 | 2 | LOAEL |
| U | 2 | 2 | 2 | No reproductive endpoints examined, but sensitive life stage evaluated |
| Total AF | 16 | 32 | 48 | $R * I * Q_1 * Q_2 * Q_3 * U = \text{Total AF}$ |
| QCE (mg/kg-day) | 10.2 | 10.2 | 10.2 | QCE = quantified critical endpoint |
| TRV | 0.638 | 0.319 | 0.213 | Toxicity Reference Value = QCE/Total AF |

| R Value | TRV (mg/kg-day) | Justification | Appropriate Functional Group |
|---------|-----------------|--|--|
| 1 | 0.638 | Test organism is in the same order and trophic level as the functional group members | none |
| 2 | 0.319 | Test organism is in a different order and same trophic level from the functional group members | AV422, AV432, AV433, AV442 |
| 3 | 0.213 | Test organism is in a different order and trophic level from the functional group members | AV121, AV122, AV132, AV142, AV143, AV210, AV210A, AV221, AV222, AV222A, AV232, AV233, AV241, AV242, AV310, AV322, AV333, AV342 |

* Estimated as $0.0582 \text{ Wt}^{0.651}$ (kg) as cited in EPA, 1993. Wildlife Exposure Factors Handbook.

COPC: Cobalt CAS 7440-48-4

Test Organisms: Dog (Omnivore, Order-Carnivora)

Exposure Medium: Diet

Test Endpoint: NOAEL

Reference: Brewer, B., 1940, "A statistical study of cobalt polycythemia in the dog," Am. J. Physiol. 128:345-348.
Agency for Toxic Substance Disease Registry (ATSDR), 1990, Draft: Toxicological Profile for Cobalt, October.

QCE: 5.0 mg/kg-day Specified

| Adjustment Factors (AF) | | | | Justification for adjustment factor |
|-------------------------|-----|-----|-----|---|
| R | 1 | 2 | 3 | R = 1 is AF for same order and trophic level R = 2 is AF for different order and same trophic level R = 3 is AF for different order and trophic level |
| I | 2 | 2 | 2 | Only females tested, 7 total dogs. |
| Q ₁ | 0.1 | 0.1 | 0.1 | Endpoint of unknown ecological significance |
| Q ₂ | 2 | 2 | 2 | Subchronic duration (4 weeks) |
| Q ₃ | 1 | 1 | 1 | NOAEL |
| U | 3 | 3 | 3 | Older study, reasonable design, no reproductive endpoints or sensitive life stage examined. |
| Total AF | 1.2 | 2.4 | 3.6 | $R * I * Q_1 * Q_2 * Q_3 * U = \text{Total AF}$ |
| QCE (mg/kg-day) | 5 | 5 | 5 | QCE = quantified critical endpoint |
| TRV | 4.2 | 2.1 | 1.4 | Toxicity Reference Value = QCE/Total AF |

| R Value | TRV (mg/kg-day) | Justification | Appropriate Functional Group |
|---------|-----------------|--|--|
| 1 | 4.2 | Test organism is in the same order and trophic level as the functional group members | M422A |
| 2 | 2.1 | Test organism is in a different order and same trophic level from the functional group members | M422 |
| 3 | 1.4 | Test organism is in a different order and trophic level from the functional group members | M121, M122, M122A, M123, M210, M210A, M222, M322 |

COPC:**Cobalt** CAS 7440-48-4**Test Organisms:**

Rat (Omnivore, Order-Rodentia)

Exposure Medium:

Diet

Test Endpoint:

NOAEL

Reference:

Nation, J.R., Bourgeois, A.E., Clark, D.E. et al., 1983, "The effects of chronic cobalt exposure on behavior and metallothionein levels in the adult rat," Neurobehav. Toxicol. and Teratology, 5:9-15.

Agency for Toxic Substance Disease Registry (ATSDR), 1990, Draft: Toxicological Profile for Cobalt, October.

QCE:

5 mg/kg-day Specified

| Adjustment Factors (AF) | | | | Justification for adjustment factor |
|-------------------------|------|------|------|---|
| R | 1 | 2 | 3 | R = 1 is AF for same order and trophic level R = 2 is AF for different order and same trophic level R = 3 is AF for different order and trophic level |
| I | 3 | 3 | 3 | Small number of male rats tested (18) |
| Q ₁ | 1 | 1 | 1 | Endpoint of relevant ecological significance |
| Q ₂ | 2 | 2 | 2 | Subchronic duration |
| Q ₃ | 1 | 1 | 1 | NOAEL endpoint |
| U | 2 | 2 | 2 | Reasonable study, but sensitive life stage not examined |
| Total AF | 12 | 24 | 36 | $R * I * Q_1 * Q_2 * Q_3 * U = \text{Total AF}$ |
| QCE (mg/kg-day) | 5 | 5 | 5 | QCE = quantified critical endpoint |
| TRV | 0.42 | 0.21 | 0.14 | Toxicity Reference Value = QCE/Total AF |

| R Value | TRV (mg/kg-day) | Justification | Appropriate Functional Group |
|---------|-----------------|--|--|
| 1 | 0.42 | Test organism is in the same order and trophic level as the functional group members | none |
| 2 | 0.21 | Test organism is in a different order and same trophic level from the functional group members | M422, M422A |
| 3 | 0.14 | Test organism is in a different order and trophic level from the functional group members | M121, M122, M122A, M132, M210, M210A, M222, M322 |